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Structure and Dynamics of a Phase-Separating Active Colloidal Fluid GABRIEL REDNER, MICHAEL HAGAN, APARNA BASKARAN, Brandeis University — We examine a minimal model for an active colloidal fluid in the form of self-propelled Brownian spheres that interact purely through excluded volume. Despite the absence of an aligning interaction, this system shows the signature behaviors of an active fluid, including anomalous number fluctuations and phase separation. Using simulations and analytic modeling, we quantify the phase diagram and separation kinetics. We show that this nonequilibrium active system undergoes an analog of an equilibrium continuous phase transition, with a critical point and a binodal beneath which the system separates into dense and dilute phases whose concentrations depend only on activity. The dense phase is a unique material that we call an active solid, which exhibits the structural signatures of a crystalline solid near the crystal-hexatic transition point, and anomalous dynamics including superdiffusive motion on intermediate timescales.

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